IN THE CLAIMS:

Claims 13, 18, 38, 54, 55, 66 and 67 have been amended herein. All of the pending claims 1 through 67 are presented below. This listing of claims will replace all prior versions and listings of claims in the application. Please enter these claims as amended.

1. (Previously presented) A system for marking integrated circuit (IC) packages comprising:

a plurality of trays, each tray being sized and configured to carry a plurality of discrete integrated circuit (IC) packages;

a transport actuator;

a tray carrier carried by, and unsecured to, the transport actuator for receiving at least one tray of IC packages of the plurality of trays;

an input shuttle assembly for providing the at least one tray of IC packages to the tray carrier;

an output shuttle assembly for receiving the at least one tray of IC packages from the tray carrier; and

a laser marking station disposed adjacent a portion of the transport actuator between the input shuttle assembly and the output shuttle assembly.

2. (Original) The system of claim 1, wherein the transport actuator further includes a tray transport having the tray carrier disposed thereon without securement thereto.

3. (Original) The system of claim 2, wherein an upper surface of the tray transport and a lower surface of the tray carrier include mutually cooperative physical structures.

4. (Original) The system of claim 3, wherein the mutually cooperative physical structures are adapted to align the tray carrier on the tray transport when the tray carrier is disposed thereon.

5. (Original) The system of claim 4, wherein portions of the mutually cooperative physical structures provide a fulcrum for tilting of the tray carrier with respect to the tray transport.

6. (Original) The system of claim 5, wherein the tray transport is rectangular, but for a corner severed therefrom adjacent the fulcrum.

7. (Original) The system of claim 6, further including a lifting device extendable to contact the tray carrier at a location remote from the fulcrum.

8. (Original) The system of claim 5, wherein the tray transport is of lesser longitudinal extent than the tray carrier.

9. (Original) The system of claim 8, wherein the tray transport is rectangular, but for a corner severed therefrom adjacent the fulcrum.

10. (Original) The system of claim 8, further including a lifting device extendable to contact the tray carrier at a location remote from the fulcrum.

11. (Original) The system of claim 10, wherein the lifting device is extendable from a location below the tray carrier and adjacent a longitudinal end of the tray transport.

12. (Original) The system of claim 3, wherein the mutually cooperative physical structures comprise a plurality of substantially hemispherical protrusions on one of the tray transport and the tray carrier, and a plurality of substantially hemispherical recesses located and sized to receive at least portions of the substantially hemispherical protrusions on the other of the tray transport and the tray carrier.

13. (Currently amended) The system of claim 12, wherein the plurality of substantially hemispherical protrusions extend upwardly from the upper surface of the tray transport and the plurality of substantially hemispherical recesses extend into the lower surface of the tray carrier.

14. (Original) The system of claim 13, wherein the tray carrier is of greater longitudinal extent than the tray transport, the tray transport is rectangular but for one corner truncated therefrom, the lower surface of the tray carrier includes an additional substantially hemispherical recess therein at a location beyond a longitudinal extent of the tray transport and proximate a longitudinal end of the tray transport opposite an end of the tray transport having the corner truncated therefrom, and further including a lifting device comprising an air cylinder having an element extendable upwardly therefrom to engage the additional substantially hemispherical recess and a substantially spherical protrusion on an end of the element sized to be received in the additional substantially hemispherical recess, the element being extendable to a degree to lift the tray carrier at the location of the additional substantially hemispherical recess.

15. (Original) The system of claim 14, further including a part movement facilitator located for contact with the tray carrier when the latter is in a lifted position.

16. (Original) The system of claim 15, wherein the part movement facilitator is selected from the group comprising a vibrator and a device configured for intermittent contact with the tray carrier.

17. (Original) The system of claim 1, wherein at least one of the input shuttle assembly and the output shuttle assembly comprises a frame defining a vertical, rectangular tray stack volume of like length and width dimensions to trays receivable in the tray carrier and a plurality of tray support element initiators mounted to the frame, each tray support element initiator having a tray support element extendable therefrom into the tray stack volume.

18. (Currently amended) The system of claim 17, wherein the plurality of tray support element initiators comprise air cylinders.

19. (Original) The system of claim 18, wherein the tray support elements are biased to extend into the tray stack volume.

20. (Original) The system of claim 19, wherein the frame comprises four frame members, each including a vertically extending notch defining a corner of the tray stack volume, each of the frame members carrying a tray support element initiator.

21. (Original) The system of claim 20, wherein the notches of two of the frame members differ in depth from the notches of another two of the frame members, and the frame members are spaced so that, in combination with the differing notch depths, the frame is adapted to receive trays in only a single rotational orientation.

22. (Original) The system of claim 20, wherein the input shuttle assembly and the output shuttle assembly include like elements.

23. (Previously presented) The system of claim 20, further including a vertically extendable and retractable lift mechanism located within the tray stack volume.

24. (Previously presented) The system of claim 23, wherein the transport actuator extends from a tray stack volume of the input shuttle assembly to a tray stack volume of the output shuttle assembly, and the lift mechanisms are configured to engage and vertically move a tray located in the tray stack volumes without contacting a tray transport on which the tray carrier is disposed.

25. (Original) The system of claim 24, wherein each lift mechanism includes a horizontally movable drive wedge element having an inclined upper surface and a horizontally constrained slave wedge element having an inclined lower surface of like angle of inclination to that of the inclined upper surface.

26. (Original) The system of claim 25, further including a lift structure secured to the slave wedge element and extending upwardly therefrom.

27. (Original) The system of claim 26, wherein the lift structure further includes two substantially parallel side plates laterally spaced a greater distance than a width of the tray transport.

28. (Original) The system of claim 27, wherein the tray carrier includes a portion of reduced width and the side plates are located to extend vertically past the tray carrier proximate the reduced width portion.

29. (Original) The system of claim 26, wherein the slave wedge element is horizontally constrained by a bearing assembly permitting substantially only vertical movement of the lift structure.

30. (Original) The system of claim 29, wherein the drive wedge element is horizontally movable by an associated dual-action drive mechanism.

31. (Original) The system of claim 30, further including a dual-action stop mechanism configured and located to selectively limit travel of the drive wedge element.

32. (Original) The system of claim 30, wherein the dual-action drive mechanism comprises a dual-action air cylinder.

33. (Original) The system of claim 32, wherein the dual-action air cylinder comprises a drive block to which the drive wedge element is mounted, the drive block being slidable on at least one guide shaft.

34. (Original) The system of claim 33, further including a dual-action stop mechanism configured and located to selectively limit travel of the drive wedge element.

35. (Previously presented) The system of claim 34, wherein the dual-action stop mechanism comprises a second dual-action air cylinder adjacent the drive block and having an extendable and retractable shaft.

36. (Previously presented) The system of claim 35, wherein the extendable and retractable shaft is horizontally extendable and retractable and located in a same horizontal plane as the drive block.

37. (Original) The system of claim 1, wherein the transport actuator extends from the input shuttle assembly to the output shuttle assembly, passing under the laser marking station, and further including a vertically extendable and retractable lift mechanism located under the laser marking station.

38. (Currently amended) The system of claim 37, wherein the lift mechanism is configured to engage and vertically move ~~a tray~~ the tray carrier while located under the laser marking station without contacting a tray transport on which the tray carrier is disposed.

39. (Original) The system of claim 38, wherein the lift mechanism includes a horizontally movable drive wedge element having an inclined upper surface and a horizontally constrained slave wedge element having an inclined lower surface of like angle of inclination to that of the inclined upper surface.

40. (Original) The system of claim 39, further including a lift structure secured to the slave wedge element and extending upwardly therefrom.

41. (Original) The system of claim 40, wherein the lift structure further includes two substantially parallel side plates laterally spaced a greater distance than a width of the tray transport.

42. (Previously presented) The system of claim 41, wherein the tray carrier includes a portion of reduced width and the side plates include extensions thereon configured to engage the tray carrier at the portion of reduced width.

43. (Original) The system of claim 41, wherein the slave wedge element is horizontally constrained by a bearing assembly permitting substantially only vertical movement of the lift structure.

44. (Original) The system of claim 43, wherein the drive wedge element is horizontally movable by an associated dual-action drive mechanism.

45. (Original) The system of claim 44, wherein the associated dual-action drive mechanism comprises a dual-action air cylinder.

46. (Original) The system of claim 45, wherein the dual-action air cylinder comprises a drive block to which the drive wedge element is mounted, the drive block being slidable on at least one guide shaft.

47. (Original) The system of claim 1, wherein the laser marking station includes a substantially bottomless enclosure located above the transport actuator and at least one laser marking head housed within the enclosure.

48. (Original) The system of claim 47, further including a vertically extendable and retractable lift mechanism located under the laser marking station.

49. (Original) The system of claim 48, wherein the lift mechanism is configured to engage and vertically move the tray carrier when located on a tray transport under the laser marking station without contacting the tray transport.

50. (Original) The system of claim 49, wherein the lift mechanism includes a horizontally movable drive wedge element having an inclined upper surface and a horizontally constrained slave wedge element having an inclined lower surface of like angle of inclination to that of the inclined upper surface.

51. (Original) The system of claim 50, further including a lift structure secured to the slave wedge element and extending upwardly therefrom.

52. (Original) The system of claim 51, wherein the lift structure further includes two substantially parallel side plates laterally spaced a greater distance than a width of the tray transport.

53. (Original) The system of claim 52, wherein the tray carrier is substantially sized and shaped to correspond to an opening in the substantially bottomless enclosure of the laser marking station so as to provide a substantially light-safe closure for the opening when the tray carrier is inserted thereinto.

54. (Currently amended) The system of claim 53, wherein the tray carrier includes a portion of reduced width defined by mutually longitudinally coextensive elongated notches in parallel sides thereof, and the side plates of the lift structure include extensions thereon configured to engage the tray carrier at the portion of reduced width, the extensions being sized to substantially prevent light leakage from the substantially bottomless enclosure in a vicinity of the reduced width portion of the tray carrier.

55. (Currently amended) The system of claim 54, further including at least one sensor associated with the substantially bottomless enclosure for confirming presence of the tray carrier within the substantially bottomless enclosure in a position effecting the substantially light-safe closure of the opening therein.

56. (Original) The system of claim 55, wherein the at least one sensor is responsive to a magnetic element located on the tray carrier.

57. (Original) The system of claim 52, wherein the slave wedge element is horizontally constrained by a bearing assembly permitting substantially only vertical movement of the lift structure.

58. (Original) The system of claim 57, wherein the drive wedge element is horizontally movable by an associated dual-action drive mechanism.

59. (Original) The system of claim 58, wherein the associated dual-action drive mechanism comprises a dual-action air cylinder.

60. (Original) The system of claim 59, wherein the dual-action air cylinder comprises a drive block to which the drive wedge element is mounted, the drive block being slidable on at least one guide shaft.

61. (Original) The system of claim 47, wherein the at least one laser marking head comprises at least two adjacent laser marking heads.

62. (Original) The system of claim 47, further including at least one inspection camera located between at least one of the input shuttle assembly and the laser marking station and the laser marking station and the output shuttle assembly.

63. (Original) The system of claim 62, wherein the at least one inspection camera comprises two inspection cameras, one between the input shuttle assembly and the laser marking station and one between the laser marking station and the output shuttle assembly.

64. (Original) The system of claim 1, wherein the tray carrier is substantially rectangular and includes a substantially planar upper surface having upwardly extending stops at each corner thereof.

65. (Original) The system of claim 64, wherein the tray carrier includes a portion of reduced width defined by mutually longitudinally coextensive elongated notches in parallel sides thereof.

66. (Currently amended) The system of claim 65, wherein the tray carrier includes a plurality of downwardly facing notches in ~~the two~~ the parallel sides thereof.

67. (Currently amended) The system of claim 66, wherein the plurality of downwardly facing notches comprises two notches on each of ~~the two~~ the parallel sides of the tray carrier.